TECHNICAL MEMORANDUM

September, 1985

URBAN WATER DEMAND ESTIMATES FOR MARTIN COUNTY: 1983 EXISTING AND COMMITTED, AND BUILDOUT

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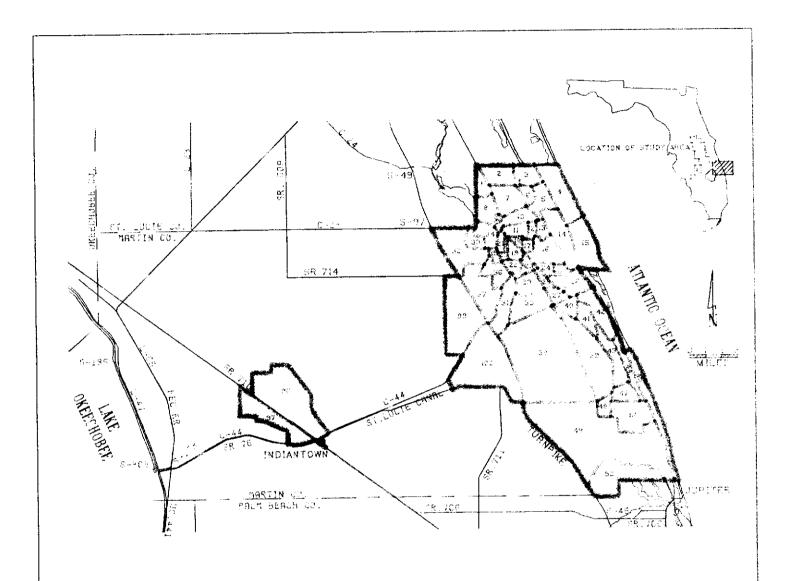
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T. INTRODUCTION

This report presents a model which projects urban water demand using population and land use data for the area in Martin County shown in Figure 1. The model was developed with a rather unique structure compared to most water demand models which simply apply an estimated per capita consumption rate to a set of population data. The model described within this report makes use of land use acreage by type, and population projections, in order to develop water demand projections by land use type. By incorporating land use data, the model becomes sensitive to changes in the Comprehensive Plan of Martin County. Having a model which is directly tied to the Comprehensive Plan of a particular region makes it possible to use the model to assist in growth management decisions.

The model uses as its inputs land use acreage by type and population projections, both of which have been provided by the Martin County Planning Department for the traffic analysis zones (TAZs) in the study area. Water use factors are applied to these data in order to estimate urban water demand by land use type by TAZ. The results of this model are being used by the Hydrogeology Division in a model which evaluates various scenarios regarding the location of wellfields and their impacts on water levels.

Following this Introduction the second section contains an overview of the current water use characteristics of Martin County. This is followed by a section which presents the planning framework of the data used as input to the model. The fourth section contains the methodology used to develop water use and source factors which are applied to the data presented in section three in order to develop projections of urban water demand. The fifth section evaluates the performance of the model by comparing ex post estimates with actual data for some of the larger utility service areas. Finally, in



* ZONES

MARTIN COUNTY STUDY AREA AND COMPONENT TRAFFIC ANALYSIS ZONES (1984) MARTIN COUNTY section six the results of the model are summarized and some suggestions for further research are discussed.

II. OVERVIEW OF PAST WATER USE IN MARTIN COUNTY

The model presented in this report was designed to estimate future urban water demand for Martin County. The first step in constructing such a model was to review historic water use characteristics for the study area. Before specifically discussing Martin County, however, it is helpful to review the general types of water use as well as the data restrictions that arise when conducting such an analysis.

Water use can best be discussed by first identifying the different types Basically water use can be placed into five user of use that exist. residential, commercial, industrial, and institutional, categories: Along with these user classifications one can make the agricultural. distinction between potable (indoor) and non-potable (outdoor) use. When water use is examined following this disaggregated structure it becomes clear that data availability plays a limiting role in the analysis. The largest void in real data exists in the area of non-potable water use, because the majority of non-potable water is self supplied and pumpage records are not maintained for the majority of private wells being used for irrigation. Typically the only real data that are available are the pumpage figures for the larger utilities (i.e., those which pump 100,000 gallons per day or more). Due to these data limitations the review of historic water use must concentrate on pumpage figures for the larger utilities, using these figures as a measure of demand. Water use must also be viewed from the supply side by examining the sources from which the water is being supplied.

Water Demand

Before developing a model for estimating water demand for a particular region it is helpful to review historic demand for that region. Table 1 shows historic demand in the form of annual pumpage for the major utilities of Martin County from 1980 through 1984. The pumpage data in Table 1 are positively correlated to time, which is reasonable since population is also positively correlated to time and water demand is directly tied to population. It is useful to adjust for population by putting the data into per capita Table 2 presents the per capita figures for each of the counties in the South Florida Water Management District (SFWMD) for 1980. indicate that on a per capita basis Martin County is one of the more water consumptive counties in the District. The population used to calculate the per capita figures in Table 2 was permanent resident population which is often significantly smaller than peak seasonal population. Using the permanent resident population figure causes the per capita figure to be higher, and since Martin County is strongly affected by seasonal population swings, one should be cautious when using these per capita figures. Under the framework developed by the Martin County Planning Department for this study, assumed that all units will be occupied year-round, thus eliminating the impact of seasonal fluctuations in population. This assumption and others will be discussed further in the following section.

Although it is helpful to review historic demand in order to project future demand it should be mentioned that in the case of Martin County, caution must be used when comparing past and future conditions. Visual inspection of new development in Martin County makes apparent the changing appearance between "old" and "new" Martin County. Normally a model is

TABLE 1

Large Utility Pumpage Data (million gallons per year)

Utility	1980	1981	1982	1983	1984
Indiantown	171.8	166.6	165.0	148.0	168.9
Indian River	15.6	18.0	18.4	21.0	29.8
Intracoastal	82.5	169.2	173.1	211.8	239.6
Hobe Sound	361.2	326.8	348.7	467.1	628.7
Beacon 21 ⁵	38.6	50.6	52.5	49.2	49.7
Hydratech	84.2	121.9	141.7	133.7	167.3
Sailfish	n/a	3.6	8.4	15.0	16.7
Joe's Point	1.6	3.1	7.5	13.8	16.2
Pine Lake Village	69.1	62.0	73.1	89.3	91.1
Piper's Landing	n/a	1.11	8.5	9.5	12.6
Southern States	49.9	57.5	52.0	57.6	62.2
River Club	4.0	6.9	7.9	7.7	4.9 ⁴
Ocean Breeze	14.8	16.2	15.1	16.8	19.5
Utilities Inc. ⁶	15.8	12.6	13.1	13.2	18.6
Stuart ²	887.7	909.8	944.0	947.9	1042.8
Martin County ³	301.8	315.4	316.6	385.1	425.8

 $^{^{1}}$ Includes only 10/81 - 12/81

 $^{^{2}\}mathrm{Does}$ not include water sold to Southern Gulf

 $^{^3}$ Includes Southern Gulf pumpage

⁴excluded 7/84 - 9/84, 12/84

⁵Previously Miles Grant Utility

⁶Previously Oz Utility

TABLE 2
Per Capita Water Consumption (1980)

County	Per Capita Rate (gpcd)
Collier	287
Palm Beach	231
Dade	195
Martin	193
Broward	187
Lee	172
*Orange	169
St. Lucie	168
*Osceola	164
*Polk	162
*Charlotte	158
Monroe	157
*Highlands	156
Hendry	153
*Okeechobee	146
Glades	140

^{*}These per capita figures apply only to the portion of the county located within the District.

Source: Technical Memorandum "A Potable Water Use Data Base for South Florida 1980"

constructed for a particular region based on historical data using the premise that the "structure" of the area being modeled is relatively stable. In Martin County this does not appear to be the case; therefore, the emphasis placed on historical demands was significantly reduced. In the fourth section there is further discussion about old and new development in Martin County and how it affects water demand.

Water Supply

The structure of the groundwater flow model, for which the results of this model are inputs, is such that demands need to be classified as either utility demand or self supplied demand. In the past the District has worked with three categories of suppliers: large utilities, small utilities (less than 100,000 gpd), and self supplied, and procedures were developed for allocating demand to each of these potential suppliers.

Historically Martin County has been about 40% self supplied, 10% small systems, and 50% large utilities. Table 3 compares Martin County's non-utility pumpage to other counties in SFWMD. The figures show that in the past, Martin County has had a relatively large percentage of non-utility demand. Caution is again emphasized when using this information for future considerations about the composition of Martin County water demand. In actuality the future of Martin County, as seen by the Martin County Planning Department, is one which will be dominated by the large utility. It is assumed that by buildout the majority of private potable wells will be given up for connections to major utilities. Small utilities are projected to disappear, as they will be absorbed by the more efficient larger utility

TABLE 3
Percentage of Total Annual Pumpage by Source (1980)

County	Self Supplied/Small System (%)
*Charlotte	100.0
*Highlands	87.0
G1 ades	75.7
*Polk	68.4
Martin	48.6
*Okeechobee	45.1
*Osceola	39.7
St. Lucie	34.1
Hendry	29.7
Orange	29.3
Lee	15.6
Monroe	13.0
Palm Beach	6.6
Dade	3.5
Collier	2.8
Broward	2.8
•	

^{*}These percentages refer only to the portion of the county located within the District.

Source: Technical Memorandum "A Potable Water Use Data Base for South Florida 1980"

systems. The effect of this on the water demand estimation process is discussed in section four.

Before proceeding to the next section it should be emphasized once again that data on past water use does provide some useful information about water demand and supply. However, since the future development in Martin County is proposed to be quite different than past development, one should hesitate to place emphasis on these characteristics of the past.

III. MARTIN COUNTY PLANNING FRAMEWORK

The water demand model developed for Martin County was based upon data provided by the Martin County Planning Department. The model uses these data to estimate urban water demand for two distinct development phases: 1983 existing and committed, and buildout. The term "existing and committed" refers to development that actually exists or has received preliminary approval from the County Commission, and "buildout" refers to the maximum amount of development expected under the current Comprehensive Plan.

Two sets of data were provided for each of the two development phases mentioned above. The first set of data consisted of land acreage for 14 land use types (i.e., rural ranchette, rural, estate, low, medium, mobile, and high residential uses; general, limited, commercial office residential, and waterfront commercial uses; industrial; institutional; and agricultural) by TAZ. These acreage figures were further classified as vacant, wetland, or developed. The land was considered "developed" if actual development existed or if there was committed development which had been approved by the County Commission. It should be mentioned that at buildout there will be zero acres of land in the "vacant" category for all land use types. Also note that

agricultural acreage was not incorporated into the model because water use for this category is handled directly in the Hydrogeology model.

The second set of data consisted of housing unit projections by type (i.e., single-family, multi-family) by TAZ. From these data population projections were constructed by applying a persons per unit rate to the housing unit data. A factor of 2.9 persons per unit was used for single-family units and a factor of 2.0 was used for multi-family units, both of which were provided by the Martin County Planning Department. In formulating population estimates the Planning Department assumed 100% occupancy. Historically the occupancy rate for Martin County was 76% (1980 census).

Given the structure of the model it was necessary to combine the housing unit data and the land use data so that the housing units could be distributed by land use type for each TAZ. For those units not yet committed to development this distribution process was quite straightforward given the assumption that single-family units were to be allocated to areas with a density less than 5 units per acre (upa) and multi-family units were to be allocated to areas with a density equal to or greater than 5 upa. This assumption about housing units, combined with the information contained in the Martin County Comprehensive Plan regarding density transfer and maximum density, laid the framework for the allocation of new housing units projected to exist by buildout.

The units in the category of "existing and committed" had to be distributed in a slightly more complicated fashion. The first step in distributing these units was to calculate the maximum number of units which could exist in each TAZ given the land use acreage data and the maximum upa for each land use category, the latter being in accordance with the

Comprehensive Plan. Existing and committed units were then distributed in proportion to the potential maximum number of units for each land use type by TAZ. The results of this distribution process are presented in Appendix A for both development phases. Appendix A also contains the acreage data for the non-residential land use categories.

IV. WATER USE AND SOURCE FACTORS

In the previous section the general framework of the data was described. This section presents the methodology used to develop water use factors by land use type which are applied to the data set in section three in order to generate estimates of urban water demand. Also discussed in this section is the issue of what sources will supply the future water needs of Martin County.

Water Use Factors

There were four types of demand for which water use factors had to be constructed: residential potable and non-potable, and non-residential potable and non-potable. The methodology used to develop such factors for Martin County was further concerned with relating these factors to each particular land use type.

Residential Potable Water Demand

Residential potable water demand was determined to be independent of land use type, thus a factor of 100 gallons per capita day (gpcd) was applied to the population projections for the county in order to generate residential potable water demand estimates. The factor of 100 gpcd is the standard used by the Department of Environmental Regulation and is provided by the Water Pollution Control Federation in their document, "The Manual of Practice for Design and Construction of Sanitary and Storm Sewers."

Residential potable water demand estimated for Martin County are shown in Tables B.1 (1983 Existing and Committed) and B.4 (Buildout) of Appendix B.

Non-residential Potable Water Demand

Unlike residential potable water demand, it was determined that non-residential potable water demand across the different land use types. The main reason for this is the wide variation in types of development associated with the various land use types. Table 4 gives a brief description of the development characteristics of the six non-residential land use categories as described in the Comprehensive Plan of Martin County. The information in Table 4 was used along with material from Technical Information Memorandum 6.2.1 of the Department of Environmental Regulation in order to develop the water use factors for non-residential potable water demand shown in Table 5.

The next step in calculating non-residential potable water demand was to take non-residential land use acreage by type and calculate the expected square footage of building space which would exist under the Proposed Land Development Code for Martin County, taking into account such things as open space requirements and maximum building cover. For the purposes of this model it was assumed that the developer would take full advantage of planning guidelines by maintaining the minimum amount of open space and the maximum building cover. Given this assumption, the acreage data was converted to building space and the factors in Table 5 were applied in order to estimate non-residential potable water demand.

It should be noted it was necessary to make some minor adjustments to the acreage data before calculating water demand. First of all, fifty percent of total vacant acreage (e.g. for future development) of waterfront commercial and commercial office residential land uses were treated as residential with

TABLE 4
Non-residential Development Characteristics

Land Use	Description
General Commercial	Retail sales and services, trade and warehouse facilities, hotels and motels
Limited Commercial	Retail shops with small floor area, small parking lot requirements, and limited inventory
Comm. Office Res.	Business offices and financial institutions, used as a buffer between intensive comm. & res.
Waterfront Comm.	Marine related services, some restaurants & shops as approved by the Planning and Zoning Board
Industrial	Accessible to rail facilities and major arterials, includes salvage yards
Institutional	Schools, government buildings, hospitals, parks and recreational areas, and public open space

Source: Martin County Comprehensive Plan (1982)

TABLE 5

Non-residential Potable Demand Factors (gallons/1000 sq. ft.)

Land Use	<u>Factor</u>
General Commercial	150
Limited Commercial	125
Comm. Office Res.	100
Waterfront Comm.	250
Industrial	100
*Institutional	175

Source: Various literature releases including memorandum 6.2.1 from the Department of Environmental Regulation

^{*}applied to 1/2 of the developed acres assuming the remainder to be public open space

development occurring at a density of 10 upa. Also, based on information provided by the Martin County Planning Department, the majority of land considered "institutional" was treated as open space, therefore no potable demands were calculated for these institutional areas.

Non-residential potable water demand estimates for Martin County are shown in Tables B.2 (1983 Existing and Committed) and B.5 (Buildout) of Appendix B.

Residential Non-Potable Water Demand

The structure of this water demand model, which involved linking water use with land use, played a major role in the development of residential non-potable (irrigation) water use factors. Each residential land use category was expected to have unique characteristics regarding maximum and actual density, type of irrigation system, and other relevant factors that influence irrigation practices, and which needed to be examined in great detail in order to develop water use factors by land use type. The basic methodology followed was to develop figures reflecting average irrigation area per unit by land use type and use this information along with the housing unit data provided in Appendix A to estimate total irrigation area by land use type. These data could then be used along with irrigation rate and frequency factors to provide non-potable water demand estimates.

A primary consideration influencing the development of residential water use factors had to do with the maximum density allowed for each land use category according to the Comprehensive Plan. It was assumed by Martin county that all new development would occur at these maximum densities, which are shown below.

Land Use Type	Maximum Density (upa)
Rural Ranchette Rural Estate	.2 .5 2.0 5.0
Low Medium Mobile	8.0 8.0
High *Waterfront *Comm. Office Res.	15.0 10.0 10.0

*This figure applies to 50% of total vacant acreage

These density figures were important because they aided in determining average lot sizes for the various land use categories and lot size was the key input in calculating irrigation area per unit by land use type.

There are two other inputs which were taken into consideration when irrigation area was calculated, both of which are based on provisions of the Comprehensive Plan of Martin County. These two provisions, open space requirements and density transfer, are of importance because they both directly affect the amount of irrigation area per unit.

Open space, as defined by the Comprehensive Plan, is comprised of permeable open surfaces, excluding principle structures and impermeable surfaces (i.e. parking lots). According to the Plan, all residential development must maintain a minimum of fifty percent of the gross land area as open space. Golf courses and wetlands can be used in calculating open space as long as the percentage of each does not exceed ten percent, thus ensuring a minimum of thirty percent of the development's upland area to be comprised of open space. In this model it was assumed that this open space would be irrigated. This provision does not apply to construction of a single-family house on a lot of record, which is a lot that was platted before April 1, 1982.

Density transfer is the other provision contained in the Comprehensive Plan which had to be incorporated into irrigation area calculations. This provision allows property owners to transfer density to the upland area of any site which contains functional wetland properties. This provision applies only to those developments submitted for review as a planned unit development and is subject to the following constraints:

- a) The gross residential density of the upland property is equal to or less than two times the gross residential density of the entire parcel, and
- b) The residential density of the upland property is less than 15 upa, and
- c) The total number of units allowed in any development using this transfer formula shall be equal to or less than the maximum allowed on the parcel determined by the density shown on the Land Use Map, and
- d) Density transferred is less than or equal to (wetland acreage x gross density).

If the above criteria are fulfilled, and a property owner takes advantage of the density transfer, then the actual lot size for each unit in that particular parcel would be smaller than one would expect since the development (upland) density would be greater than the established land use density. It was assumed in this model that property owners would, for the most part, take full advantage of this density transfer privilege and it was therefore included in the process of estimating average irrigation area per unit by land use type.

Table 6 contains the average per unit area of irrigation figures by land use type. There are two sets of numbers shown, one set for existing units, another set for committed and future units. This time distinction was made in order to reflect the changing character of development in Martin County when comparing old development with new development. For example, the land use categories of low, medium, and high are generally associated with community developments, and in the future these developments will be taking advantage of the density transfer provision described above. The use of density transfer leads to a smaller lot size per unit, therefore a smaller area per unit will require irrigation. Actual on-site inspection of both old and new housing units in each land use category verified the figures shown in Table 6.

After developing the factors of irrigated area per unit it was necessary to examine irrigation system design characteristics. The main issue of concern was what percentage of units in each land use type would have automatic irrigation systems. This was an important distinction because data indicate that those units with systems irrigate at a greater frequency than those without. The percentages shown in Table 7 were based upon a sample of units observed throughout the study area as well as information provided by the Florida Irrigation Society. The distinction between "old" and "new" refers to those systems installed before or after 1980. It was necessary to develop these two sets of figures in order to reflect the changing irrigation requirements of new development compared to old development. The percentages are higher for the newer development because the newer development is more elaborately landscaped and the turfgrass being used for lawns (St. Augustine grass) requires more irrigation than the turfgrass used by much of the older development (Bahia grass).

TABLE 6

Residential Irrigation Area Factors (square feet/dwelling unit)

Land Use	Existing	<u>Future</u>
Rural Ranchette	23,500	23,500
Rural	20,000	20,000
Estate	13,500	13,500
Low	7,000	5,400
Medium	4,800	3,600
High	1,300	800
Mobile	800	1,500
Comm. Off. Res.	1,300	1,500
Waterfront Comm.	1,300	1,500

TABLE 7
Units with Automatic Irrigation Systems (percentage)

Land Use	Existing Development (1980)	New Development (post 1980)
Rural Ranchette	25%	50%
Rural	25%	50%
Estate	75%	100%
Low	25%	90%
Medium	50%	100%
High	50%	100%
Mobile	50%	50%
Comm. Office Res.	50%	100%
Waterfront	50%	100%

The final step before estimating residential non-potable water demand involved developing assumptions about irrigation application rates and application frequency; both the Florida Irrigation Society and IFAS helped in formulating these assumptions. Sprinkler systems installed before 1980 were assumed to apply 1/2" per acre per application, and systems installed after 1980 were assumed to apply 3/8" per acre per application. This reduction in the application rate reflects the change from a jet head to a mist head.

Those that irrigate by other means (i.e., garden hose) were assumed to apply 1/4" per acre per application. The application frequency for those units with systems was assumed to average out to three times a week which is 155 applications a year. Those that irrigate by other means were assumed to concentrate their efforts during the dry season leading to a yearly figure of 60 applications.

With all the assumptions described above one could then proceed with the estimation of residential non-potable water demand. Because the various assumptions have a time element built into them it was necessary to separate the housing unit data into three categories: units developed through 1980, units developed after 1980 through 1983, and projected units not yet developed. After placing the housing units in these various categories it was simply a matter of applying the factors developed above to the housing units distributed by TAZ by land use type.

Residential non-potable water demand estimates for Martin County are shown in Tables B.1 and B.4 of Appendix B.

Non-residential Non-potable Water Demand

The procedure for estimating non-residential non-potable water demand was somewhat restricted by the data available, that being acreage figures for 1983

existing and committed, and buildout. The leading factor used to develop demands from these data was the open space requirement, similar to that which was used for residential demand estimation. General commercial, waterfront commercial, and industrial land uses are subject to a twenty percent open space requirement. Commercial office residential, and institutional development must maintain forty percent open space. Finally, limited commercial development must have thirty percent open space.

Non-potable water demands were estimated by applying the open space requirement for each land use to the acreage data thus giving an estimate of irrigated area. This area information was then used along with the application rate and frequency factors previously discussed in order to estimate non-residential non-potable water demands by land use type by TAZ.

Non-residential non-potable water demands for Martin County are shown in Tables B.3 and B.6 of Appendix B.

Water Sources

The water demand estimates in the previous section were formulated so that they could be used in the Hydrogeology Division's groundwater flow model. The structure of the groundwater flow model is such that it specifically inputs only utility supplied water from central wellfields. Self supplied water is handled differently because much of it is used for irrigation and the amount withdrawn far exceeds the amount actually consumed. To adjust for this, the model specifically inputs utility demand only and incorporates an evapotranspiration factor to account for the consumption associated with non-potable water use.

In section two information was provided about the various sources that have existed in the past in Martin County, those being private wells, small

systems, and large utilities. This section is concerned with future sources in Martin County and addresses this issue for both potable and non-potable water use.

Potable Water Use

Potable water sources in the past fell into all three categories, including private wells, small systems, and large utilities. The future, however, is projected to be quite different. The planning assumption developed by Martin County for this study is that small systems will eventually be disbanded with customers hooking up to larger utilities. It is also projected by Martin County that the majority of private wells will disappear. Only developments in the lower density categories of rural ranchette and rural are assumed to remain on private wells through buildout. Exceptions to this assumption are the estate density developments in TAZ's 38 and 100 which are assumed to remain self supplied because they are outside the urban service area.

This information was incorporated into the water demand estimates in two stages. First of all, for the 1983 existing and committed estimates, adjustments were made to potable demand by subtracting out the demand attributed to private wells and small systems. The buildout estimates were also adjusted but only for those units which would still be self supplied (i.e., rural ranchette, rural, and some estate). With these assumptions the estimates presented in Appendix B were adjusted so that they represented utility demands. It should be noted that due to data limitations it was necessary to assume that all non-residential potable water was utility supplied.

Non-potable Water Use

The basic assumption made about non-potable water use was that the majority of it would be self supplied, with people taking advantage of the cost savings associated with using a private well or available surface water for irrigation. It was assumed 100% of non-potable use attributed to rural ranchette and rural would be self supplied, 95% for estate, 85% for low, medium, high, and commercial office residential, 75% for mobile, and 0% for waterfront. Non-residential non-potable water demand was assumed to be 85% self supplied.

After developing these assumptions about water sources, it was then possible to take the water demand estimates shown in Appendix B and adjust them so that they reflected utility demand.

The utility demand figures for both potable and non-potable uses are shown in Appendix C.

V. MODEL VALIDATION

In this section the water demand model described herein is used to generate water demand estimates for 1980 for two sub-areas so that these estimates can be compared to actual pumpage for 1980. The two sub-areas were chosen so that their boundaries followed those of major utility service areas. The two areas used for this analysis were the Stuart utility service area, and the service area which includes Hydratech, Intracoastal, Hobe Sound, and Miles Grant utilities.

Stuart Utility Service Area

The first step in the validation process was to take the 1983 existing and committed housing units by land use type and adjust them to the 1980

level. After completing this task it was simply a matter of applying the water use factors presented in Section IV in order to estimate water demand. These estimates were then adjusted to utility demands, taking into account both potable and non-potable self supplied. A summary of the residential water demands is shown in Table 8.

The non-residential water demands were calculated by first adjusting the 1983 existing and committed acreage to 1980 acreage. To make this adjustment it was assumed that the 1980 non-residential level of development would be the same percentage of 1983 existing and committed as was residential (i.e. 84.7%). This assumption was made because the 1980 housing unit data was based on census data and there was no real data for 1980 non-residential acres. Potable and non-potable water use factors from Section IV were applied to the 1980 acreage figures in order to estimate non-residential water demand. These demands were then adjusted to utility demands. Non-residential water demands are summarized in Table 9.

The final step was to add residential and non-residential utility demands and compare that total with the actual pumpage figure for the Stuart utility for 1980 (i.e., 887.7 million gallons). The model estimates utility pumpage to be 1324.4 million gallons and at first it appears that the validity of the model is questionable. This discrepancy actually points out the effect of some of the planning assumptions regarding occupancy rate and persons per unit.

According to the 1980 census the occupancy rate for the city of Stuart was 80.5% and the average persons per unit was 1.8. If these factors were used with the housing unit data, utility potable water demand would decrease from 696.5 million gallons (mg) to 445.9 mg, which would reduce estimated pumpage for 1980 to 1073.8 mg.

TABLE 8
Estimated Residential Water Demand
Stuart Service Area 1980
(million gallons)

Land Use	<u>Units</u>	<u>Population</u>	Potable (mg)	Non-potable (mg)
Estate	127	368	13.5	66.1
Low	2,588	7,502	274.6	345.8
Medium	488	1,357	49.7	67.5
Mobile	447	894	32.7	10.3
High	4,617	10,281	376.3	173.1
Comm. Off. Res.	99	198	7.3	3.7
Waterfront	38	76	2.8	1.4
Totals	8,404	20,676	756.9	667.9

Adjusted Potable: $756.9 - 60.4^{1} = 696.5 \text{ mg}$ Adjusted non-potable: = 89.9 mg

Residential Utility Demand: = 786.4 mg

¹private wells demand

TABLE 9
Estimated Non-residential Water Demand
Stuart Service Area 1980
(million gallons)

Land Use	Acres	Potable <u>Demand</u>	Non-potable <u>Demand</u>
General	333.7	238.8	210.7
Limited	6.6	3.9	3.1
Comm. Off. Res.	54.2	25.9	34.2
Waterfront	7.3	8.7	2.3
Institutional	268.1	132.5	87.6
Industrial	148.7	70.9	46.9
Totals	818.6	480.7	381.8

Non-residential Potable Demand = 480.7 mgAdjusted Non-potable Demand = 57.3 mgNon-residential Utility Demand = 538.0 mg Another source of error involved using information contained in the Martin County Comprehensive Plan regarding open space requirements and maximum building cover for non-residential development. This was a problem because the majority of the development that existed in 1980 was developed without such a plan and most likely would not conform to the present planning guidelines. Because there was very little real data about 1980 non-residential water use, it was difficult to adjust the non-residential water demand estimates for 1980.

The problem is that the model is designed to estimate future water demands for Martin County, which will be dominated by "new" development constructed under the guidelines of the Comprehensive Plan, making it difficult to adjust the model for the non-residential development for 1980. The second sub-area chosen had less non-residential acres and should therefore be a better area to use for validation purposes.

Hydratech, Intracoastal, Hobe Sound, and Miles Grant Service Area

The same procedure used for Stuart was used for this area, beginning with the residential demands which are summarized in Table 10. A minor difference in this area is that the residential potable demands were adjusted for small systems as well as private wells. The Stuart area did not contain any small systems.

Non-residential water demands were calculated using the same procedure as described previously. It was determined from the residential data that this area was 70% developed in regards to 1983 existing and committed development, therefore 70% of the 1983 existing and committed non-residential acres were assumed to be developed in 1980. A summary of the non-residential water demands is shown in Table 11.

TABLE 10

Estimated Residential Water Demand
Hydratech, Intracoastal, etc. Service Area
(million gallons)

Land Use	<u>Units</u>	Population	Potable (mg)	Non-potable (mg)
Rura1	360	1,044	38.2	173.5
Estate	1,153	3,344	122.4	600.4
Low	3,749	10,300	377.0	501.0
Medium	1,610	4,141	151.6	222.8
Mobile	1,244	2,488	91.1	28.7
High	264	528	19.3	9.9
Comm. Off. Res.	7	14	.5	.3
Waterfront	9	18	.7	.3
Totals	8,396	21,877	800.8	1500.9

Adjusted potable: $800.8 - 399.5^{1} - 88.4^{2} = 312.9 \text{ mg}$ Adjusted non-potable: = 110.4 mgResidential Utility Demand: = 423.3 mg

 $^{^{1}\}mathrm{private}$ wells demand

 $^{^2\}mathrm{small}$ systems demand

TABLE 11 Estimated Non-residential Water Demand Hydratech, Intracoastal, etc. Service area (million gallons)

Land Use	Acres	Potable <u>Demand</u>	Non-Potable <u>Demand</u>
General	122.2	87.4	77.1
Limited	25.8	15.4	12.2
Comm. Off. Res.	8.4	6.3	5.3
Waterfront	16.6	12.5	10.5
Institutional	136.6	57.0	76.0
Industrial	240.8	114.9	43.1
Totals	550.4	293.5	224.2
Non-residential Potable Demand Adjusted Non-potable Demand		= 293.5 mg = 33.6 mg	
Non-residential Utility Demand		= 327.1 ma	

= 327.1 mg

Residential and non-residential utility demands were then added together and compared to the annual pumpage figure for the combined service areas for 1980 (i.e., 600.5 mg). The estimated pumpage for the area for 1980 was 750.4 mg. Once again the estimated value is larger than the actual pumpage, but this can partially be attributed to historical deviations from the planning assumptions about occupancy rate and persons per household.

According to the 1980 census the occupancy rate for Martin County was 76% and the persons per unit was 2.03. Incorporating these factors into the residential demand estimates leads to a decrease in utility potable water demand from 312.9 mg to 173.3 mg, which would reduce estimated pumpage for 1980 to 610.8 mg.

This validation process has made apparent that the model cannot be used as is for ex post forecasting. The main reason for this relates to the assumptions made by the Martin County Planning Department regarding occupancy rate and persons per unit. These assumptions lead to a maximum estimate of population, which for future considerations may be a safe approach, but using these assumptions for historic projections introduces an upward bias, making it difficult to evaluate the accuracy of the model.

VI. SUMMARY, CONCLUSION, AND SUGGESTIONS FOR FUTURE RESEARCH

The water demand model presented in this report was developed to estimate water demand for Martin County for 1983 existing and committed, and buildout. The model uses population, housing unit, and land use data provided by the Martin County Planning Department to generate estimates of residential potable and non-potable water demand, and non-residential potable and non-potable water demand.

Prior to designing the model it was necessary to review historic water use characteristics of Martin County. It was found that in the past Martin County has had a relatively large percentage of users which were self supplied (40%) or connected to small systems (10%), leaving only 50% of the water users connected to large utility systems. The Planning Department expects this supply structure to change, with the trend leading toward the majority of users connecting to a large utility system. This was an important consideration because the demand estimates were adjusted to represent utility demand and then used as input to the Hydrogeology Division's groundwater flow model which evaluates the impact of withdrawals from central wellfields on water levels.

As it turned out, the review of historical development patterns for Martin County made it apparent that past and future development in the area are expected to be quite different, thus making it difficult to relate future water use to historic water use. With this, it was necessary to make extensive use of the various provisions in the County's Comprehensive Plan which establish guidelines for present and future development.

The data provided by the Planning Department suggest that Martin County will experience considerable growth. The present population of Martin County is 77,519 (estimated as of April 1, 1984) and is projected to grow more than 325% reaching almost 330,000 by buildout. Population projections for the County were based upon housing unit data and persons per unit factors of 2.9 and 2.0 for single-family and multi-family housing units respectively. The Martin County Planning Department assumed 100% occupancy, thus making the population projections a maximum estimate of population based on the housing unit data.

Water demands were estimated using the aforementioned population projections, as well as housing unit and land use data. The projected utility urban water demand for 1983 existing and committed was 20.9 million gallons per day (mgd) and 55.9 mgd for buildout. It should be emphasized that, due to the planning assumptions made about persons per household and occupancy rate, these demands represent maximum demands. It may be useful to use more historically based assumptions, especially regarding occupancy rate, and evaluate the impact this has on the demand estimates.

A final topic of interest which would affect water availability in Martin County is wastewater reuse. At this time Martin County has yet to format a structured policy regarding the future of wastewater reuse in the area. Due to this limiting factor it was only possible to consider potential wastewater reuse in a general fashion, looking mainly at the relationship between potential supply and demand. This analysis is presented in Appendix D.

APPENDIX A

POPULATION, HOUSING UNIT, AND NON-RESIDENTIAL ACREAGE DATA

TOTALS	2 2 2 2 3 3 4 4 4 4 5 4 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
SI SI	$\frac{R}{2}$
1153	10000000000000000000000000000000000000
7359	ESTATE 111 120 130 140 150 160 160 170 160 170 160 160 170 17
21521	00000000000000000000000000000000000000
7388	MED 10 MED 11 MED 10 ME
4885	MOMILE 1180M 120 120 120 120 120 120 120 120 120 120
9477	H 10 11 1 2 2 1 1 1 2 2 2 2 2 2 2 2 2 2 2
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226	######################################
27687	######################################
24694	FAMILY 1104 1104 1104 1104 1104 1104 1104 110
129680	POPULATION POPULA

TABLE A.1
ESTIMATED HOUSING UNIT DISTRIBUTION
EXISTING AND COMMITTED (1983)

TOTALS	2 R-4484BBB514BB514BBB86BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
1610	R R R R R R R R R R R R R R R R R R R
7613	RUR RUR 850001111100000000000000000000000000000
24054	ESTRIE 14-98 14-98 14-98 14-98 14-98 11-14-11 12
62231	1122111
16676	MEDIUM 1294 1294 1294 1295 1294 1295 1295 1295 1295 1295 1295 1295 1295
7244	#081LE 2180 10679 1060 2370 2300 2300 2300 2300 2300 2300 230
12946	11 M 2 M 2 M 2 M 2 M 2 M 2 M 2 M 2 M 2 M
3078	
617	2000 Mooo Mooo Mooo Mooo Mooo Mooo Mooo
63841	FAMILY FA
72228	FAMILT 1 1230888 1111 2212 2489 122148
329595	POPULATION 1142444444444444444444444444444444444

TABLE A.3 DEVELOPED NON-RESIDENTIAL ACRES EXISTING AND COMMITTED (1983)

TAZ	GENERAL		COR			INSTIT.	
1 2	101 4 2.3	0	0	O O	O O	0	101 42.3
<u> </u>	42.5 34.9		1.9		9.2	Ö	106.1
	12.9		1.7	2.8	7 * ~	47.1	
5	25.2	17	36.3	19.3	ŏ	86.1	
6	23.9	ó	3.4	0	Õ	17.9	
7	41	õ	13.5	ō	27,5	0.2	82.2
8	34.9	O	9.7	Ō	O	8.3	52.9
9	15	0	15.2	O	17.5	O O	47.7
10	15.9	8.8	13.7	11.9	9.1	Ö	59.4
1 1	Ö	0	27.7	Ō	O	22.4	
12	2.8	O	0.7	O	Ō	3.2	6.7
13	3.5	0	37.8	O	O	O	41.3
14	9.8	Q	Ö	Ō	Ô	12.2	22
15	O 17	O	Q		Ö	10.5	10.5
14	1 /	, , <u>°</u>	6.5	2.1	6 0	83.8	31.6
17 18	0	0	0 21.2	0 0	13.7	111.7	83.8 146.6
19	185.2		() ()	0	56.3	17.4	258.9
2021	77,2	0	18.1			6.4	
22	18.8	7.8			0	62.4	
23	75.6	0	Ô	Ö	82.5	27.5	185.6
24	27.9		Õ	0 0	4.6	71.6	
25	17.9	Ö	1.6		Ö	16.5	57.7
26	O	O	O		0 0	2	27.7
27	25	11.4	3.7	Q		28.5	142
28	9.9	O O	O	O	251.3	0	261.2
29	7.8	· ()	18.3	Q	Ö	O	26.1
30	15.5	2.1		O	O	29.3	51.6
31	9.4	O	Ö	3.1	0	0	12.5
32	O	O	Ö	0			52.2
33	0	0	0	0	0	40.3	40.3 0
34	0 5.3	. 0	O 1	0 15.6	O :	0 0	21.9
35 3 6	20.9	· 6	1. 22.5				
37	بر م ن م	0	لب ه کدند ()	0 0	, co	Ü	/T.S
38	Ö	Ő	ŏ	ŏ	Õ	1	i
39	Õ	6	1.7	ŏ	Õ	Q	7.7
40	22.8	Ö	16.7	Ö	14.7	O	54.2
41	0	0	0	O	Ö	0	0
42	Q	0	O	. O	O	65. 2	65.2
43	58.6	6.8	1.8	0	O	1.3	48.5
44	10.1	O	O	Ŏ	Q	10.1	20.2
45	O	0	Q	0	O	Q	O
46	0	O	O	0	Ó	Ō	0
47	2.4	18.6	Ō	O	0	0	21
48	. O	Õ	O .	0	3	0	
49	Q	Ö	34.6	4.1	0	0	38.7
50	Ö	0	O A	0	0	0	70 0
96 °	3 8. 1	. 0	0	() (27) (0)	7.00 7	41.8 29.2	79.9 446.5
97 98	62.8 0	0	0	24.8 0	32 9. 7 41.3	47.4 0	440.3
78 99	Ö	0	0	0	O 41"?	. 0	****O
100	1.8	O O	0	38.5	Ö	0	40.3
TOTALS		161.2	314.4		999.6	2605.7	5342.6

TABLE A.4 DEVELOPED NON-RESIDENTIAL ACRES BUILDOUT

TAZ	GENERAL	LIMITED	COR		INDUST.	INSTIT.	
1	123	, o	7.5	Ö	O	16.5	
23	58.8		O	Q	-	66.1	
.5	34.9	54.2	1.9	11.9		71.8	183.9
4	26.7		1	11.1	O	107.3	168.6
5	25.2	1.7	39.9	19.3		86.1	187.5
6	31.3	0	33.2	0	O		82.4
7	101.8	O	43.4	Ó	134	3	282.2
8	38.6	Θ.	22.9	O	Ŏ	8.3	69.8
9	75.5	O	25.3	0	28.1	. 0	126.9
10	20.3	8.8	29.7	11.9			
11	O	O	27.7	0	Ö		
12	2.8	Q	0.7	O	O	3,2	6.7
13	3.5	Q	42.8	O	Ò	. O	46.3
14	9.8	Ö	Q	O	O	12.2	22
15	O	0.7	0		0	19.4	20.1
16	20.9	O	6.5		· 6	. 0	35.5
17	-	Ç.	О	Q			83. 8
18		0	21.2			111.7	
19	209.7	0			64.6		
2021	77.2		18.1	<u>6</u>	Ö	6.4	
22	43.6	7.8			0	62.4	130
23	96.7	0	25.8		97.3		
24				0		71.6	
25	19	0	3.9	21./	0		
26		. 0			0		
27		15.4			97.3		
28	9.9	O	0			O A	416.2 169.6
29		Ŏ ·			0		162.1
30		9.4	19.2		0		
31		O O	43	10.7 ()			244.1
32 33	36.8 0	0	~r-> O	o O	<i>1.2.0.</i> 0		40,3
34	0	==				0	
35	5,3		7 5	15 A		34	
36 36	39.8	6.5	40 3	n	16.5	30.6	
37		0			0		
38	3	ŏ	0	ŏ	ŏ	52.4	55.4
39	2.8			ŏ	Õ	Ö	88.7
40	26	8	44.1	Õ	14.7	ō	92.8
41	14.7	ō	Ö	Ö	Ö	O	
42	0	Ō	O	0	Ö	113.8	113.8
43	96.6		35.8	o	Ç.		
44	10.1	Ö	6.4	0	0	31	47.5
45	0	O	0	Ö	0	O	Ō
46	0	O	0	О	0	O	O
47	2.4	38.3	21.9	0	O	, O	62.6
48	o o	O	O	O	182.8	98.1	280.9
49	0	0	36	10.1	O	0	46.1
50	O	0	O	0	O	O	O
96	104.1	0	O	O			145.9
97	125.9	O	O	24.8	1594.4		
98	0	O	O	O	652.9		652.9
99	O	Q	O	O	0		
100	18.4	45.5	2.4	77.1	O	Ö	143.4
TOTALS	1755.7	288	877.9	267.1	3459.2	1632.9	8302.8

APPENDIX B

ESTIMATED WATER DEMAND 1983 EXISTING AND COMMITTED AND BUILDOUT

-	4
(\supset

TOTALS		
26.094	7.000.000.000.000.000.000.000.000.000.0	
480,573	11 21 21 21 21 21 21 21 21 21 21 21 21 2	
3735.381	1134 - 0.00000 - 0.0000 - 0.0000 - 0.0000 - 0.0000 - 0.0000 - 0.0000 - 0.00000 - 0.0000 - 0.0000 - 0.0000 - 0.0000 - 0.0000 - 0.0000 - 0.00000 - 0.0000 - 0.0000 - 0.0000 - 0.0000 - 0.0000 - 0.0000 - 0.00000 - 0.0000 - 0	
3447.942	1110.05 111	
1045.954	1111777mm 1111777mm 110000000000000000000000000000000000	
120.964	20000000000000000000000000000000000000	
345.261	### ##################################	
12.609		
9.310	NOOTOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO	
9224.087	126 9884 1135 9884 1135 9884 1135 9884 1135 9884 1135 9884 1135 9884 1136 9884 1136 9884 1137 9884 1138 98	
129680	POP 290 270 270 270 270 270 270 270 270 270 27	
4733.331	10.585 1176.850 1176.	
13957.418	TOTAL 2216 2274 620 2277 0294 620 2274 620 2277 0294 620 2274 620 2277 0294 620 2277 0294 620 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 629 2277 0296 6296 6296 6296 6296 6296 6296 6296	

TABLE B.2 ESTIMATED NON-RESIDENTIAL POTABLE WATER DEMAND EXISTING AND COMMITTED-1983 (MGY)

TAZ	GENERAL	LIMITED	COR	WATER	INDUST.	INSTIT.	TOTAL
1	72.263	0.000	Ø.ØØØ	0.000	0.000	0.000	72.263
2	30.265	0.000	0.000	0.000	0.000	0.000	30.265
3	24.970	32.316	Ø. 9Ø6	7.035	4.388	0.000	69.616
4	9.230	13.415	0.477	3.339	0.000	19,658	46.118
5	16.599	10.136	17.314	23.014	0.000	35.935	102.998
<u>6</u>	17.100	0.000	1.622	0.000	0.000	7.471	26.192
7	29.334	0.000	6.439	0.000	13.117	0.083	48.974
8	24.970	0.000	4.627	0.000	0.000	3,464	33.061
. 9	10.732	0.000	7,250	0.000	0.347	0.000	26.329
10	11.376	5.247	6.535	14.190	4.341	0.000	41.688
11	0.000	0.000	13,212	0.000	0.000	9.349	22.561
12	2.003	0.000	0.334	0.000	0.000	1.336	3.673
13	2.504	0.000	18.030	0.000	0.000	0.000	20.534
14	7.012	0.000	0.000	0.000	0.000	5.092	12.103
15	0.000	0.000	Ø.ØØØ	0.000	0.000	4.382	4.382
16	12.163	0.000	3.100	2.504	2.862	0.000	ZØ.629
17	0.000	0.000	0.000	0.000	0.000	34.975	34.975
18	0.000	0.000	10.112	0.000	6.535	46.619	63.266
19	132.506	0.000	0.000	0.000	26.854	7.262	166.622
2021	55.234	0.000	8.634	0.000	Ø. ØØØ	2.671	66.539
22	13.451	4.651	Ø.525	18.006	0.000	26.043	62.675
23	54.090	0.000	0.000	0.000	39.351	11.477	104.918
24	19.962	0.000	0.000	0.000	2.194	29.883	52.039
25	12.807	0.000	0.763	25.876	0.000	6.886	46.333
26	0.000	0.000	0.000	30.646	0.000	Ø.835	31.481
27	17.887	6.797	1.765	0.000	35.010	11.895	73.354
28	7.083	0.000	0.000	0.000	119.866	0.000	126.949
29	5.581	0.000	8.729	0.000	0.000	0.000	14.309
30	11.090	1.252	2.242	0.000	0.000	12.229	26.812
31	6.725	0.000	Ø. ØØØ	3.697	0.000	0.000	10.422
32	0.000	Ø.000	0.000	0.000	24.898	0.000	24.878
33	0,000	0.000	0.000	0.000	0.000	16.820	16.820
34	0.000	0.000	0.000	0.000	0.000	0.000	0.000
35	3.792	0.000	Ø. 477	18.602	0.000	0.000	22.871
	14.953	3.577	10.732	0.000	3.625	7.304	40.192
37	0.000	0.000	0.000	0.000	0.000	0.000	0.000
38	0.000	0.000	0.000	0.000	0.000	0.417	0.417
39	0.000	3.577	0.811	0.000	0.000	0.000	4.388
40	16.313	0.000	7.966	0.000	7.012	0.000	31.290
4 i	0.000	0.000	0.000	0.000	0.000	0.000	Ø.ØØØ
42	0.202	0.000	0.200	0.000	0.000	27.212	27,212
43	41,927	4.054	Ø.859	0.000	0.000	0.543	47.382
44	7.226	0.000	0.000	0.000	0.000	4.215	11.442
45	0.000	0.000	0.000	0.000	0.000	0.000	0.000
46	0.000	0.000	0.000 0.000	0.000	0.000	0.000	0.000
47	1.717	11.090	0.000	0.000	0.000	0.000	12.807
48	0.000	0.000	0.000	0.000	1.431	0.000	1.431
49	0.000	0.000	16.504	4.887	0.000	0.000	21.373
50	0.000 0.000	Ø.000	0.000	0.000	0.000	Ø. ØØØ	0.000
96	27.260	Ø.000	0.000	0.000	0.000	17.446	44.705
97	44,932	0.000	0.000	29.573	157.261	12.187	243.952
77 78	0,000	Ø. ØØØ	0.000	0.000	19.699	0.000	19.699
70 79	0.000 0.000	Ø.000	0.000	0.000	0.000	0.000 0.000	0.000
100	1.288	Ø. ØØØ	Ø.ØØØ	45.910	0.000 0.000	0.000 0.000	47.197
1. V.FV.F	a a at COCO	m a man	KT F KTKTKT	TU 6 7 1 MJ	WIN WINN	6.6 66	77/117/
TOTALS	766.343	96.112	149.963	227.282	476.791	363. 487	2080.178
		,					

TABLE B.3
ESTIMATED NON-RESIDENTIAL NON-POTABLE WATER DEMAND
EXISTING AND COMMITTED-1983 (MGY)

**** *\ ***	Carthur to As	i makammenya	ייין פיין איים.	totak merendek	7 8 1 7 1 1 7 7 7	The second of the	77 (7) 77 (5)
TAZ	GENERAL	LIMITED		WATER		INSTIT.	
1	63.764	0.000		0.000	0.000	0.000	63.764
2	26.705	0.000	0.000	0.000		0.000	26.705
	22.033	25.664	1.200			0.000	
4	8.144		0.631	0.884		14.868	35,181
5	14.647	9.049	22.917			27,179	
6	15.089	0.000	2.147		0.000	5.650	22.886
7		0.000	9.523			0.063	
8	22.033	0.000	6.124	0.000		2.620	
9	9.470	Ø.000		0.000		0.000	24,590
10	10.038		8.649	3.754			
11	0.202	0.200		0.000		7.Ø71	
12	1.768	0.000	0.442				3.220
13	2.210	0.000		Ø. ØØØ		0.000	
14	6.187					3,851	
15	0.000			0.000		3.314	
16	10.733	0.000				0.000	17.393
17	0.000	9.0 0 9			, .	26.453	
18	0.000	0.000	13.384			35.260	52.969
19	116.923	0.000	0.000	0.000		5.493	140.187
2021	48.739	0.000				2.020	62.286
22	11.869					19.698	
25	47.729	0.000				8.681	
24	17.614	0.000			1.452	22.602	
25	11.301	0.000		6.850		5.208	
26	0.000			8.113			8.744
20 July 100	15.783		2.356			8.996	
28	6.25Ø	Ø.ØØØ		0.000	79.327	0.000	
29	4.924	0.000	11.553		0.000	0.000	16.478
30	9.786	0.994	2.967		· · · · · · · ·	9.249	
31	5.935	0.000	Ø. ØØØ		(m. 10 Pai 141 Pai	0.000	6.913
32	0.000	Ø. ØØØ		0,000		0.000	
ास । १८८१ म	0.000	*** * *** ***	0.000			12.721	
34	0.000	0.000		0.000		0.000	
35	3.346		0.631			0.000	8.902
36	13, 195	2.841		0.000	2.399	5.524	38.164
37	0.000	0.000	0.000		0.000	0.000	0.000
38	0.000		0.000				0.316
39	0.000		1.073				3.914
40	14.394	0.000				0.000	
41	0.000	0.000	0.060	0.000		0.000	0.000
4.2	0.000		0.000	0.000		20.581	
43	36.996		1,136	0.000		0.410	· ·
44	6.376		Ø. 2 00	0.000			9.565
45	0.000	Ø.Ø00	0.000	0.000			0.000
46	0.000		2.00 0	0.000		0.000	
47	1,515	8.807	0.000	0.000		0.000	
48	0.000	Ø.000	0.000			0.000	0.947
49	0.000	0.000	21.844			0.000	
50	0.000	Ø.000	Ø.000	0.000		0.000	Ø. ØØØ
9.6 0.7	24.054		0.000	0.000		13, 195	
9 <i>7</i>	39.648	0.000		7.828		9.217	
98	0.000				13.037		
99	Ø. Ø ØØ	Ø.000					0.000
100	1,136	0.000	0.000	12.153	0.000	0.000	13,289
TOTALS	676.219	76.328	198.4 90	6Ø.166	315.539	275 .0 71	1601.812

TOTALS	2007 - 00 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
85 8.968	######################################	
3425.300	181-1-0000 119-1-	
11901.573	ESTRICES 174 431 564 174 189 1	
10822.152	277 277 277 277 277 277 277 277 277 277	ESTIMATED
2257.481	110.000 110.00	TED RESIDENTIAL
201.618	%,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	TABLE
445.827	00000 Min 00000 Min 00000000000000000000	ER DEMAND
162.669	00000000000000000000000000000000000000	- B UILDOUT
30.561	1200-1-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0	(MGY)
50106.148	976-9876 976-9876 976-9876 2512-756 2512-756 2512-756 125-488 125-488 125-488 125-488 125-488 125-246	
329595	POP. 14583 4583 4583 4583 4583 4583 4583 4583	
12030.214	ოს ახიდის გითიითის იუდიტულის ებიკობიდან ასასაციადის ითითის ასასაციადის ასასაციადის ა	
42136.361	888 0 1 1 1 0 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2	

TAZ	GENUSE	LIMUSE	CORUSE	WATUSE	INDUSE	INSTUSE	TOTAL.
1				0.000	0.000	6.886	98.372
				0.000	0.000	27.587	69.657
2				14.190	4,388	29.966	106.737
3	24.970		0.906				91.014
4	19.103		0.477	13.254	0.000	44.783	
5	i8.Ø3Ø	10.136	19.032		0.000	35.935	106.146
6	22,394	0.000	15.836	0.000	Q , Q Q Q	7.471	45.7Ø1
7	72.835	0.000	20.701	0.000	63.916	1.252	158.704
8	27.617			0.000	0.000	3.464	42.004
9	54.018	0.000	11.114	0.000	13.403	0.000	78.535
10	14.524	5.247	14.166		5.295	0.000	53.422
			13,212	0.000	0.000		22.561
11		0.000				1.336	3.673
12	2.003		0.334	0.000	0.000		22.919
13			20.415	0.000	0.000	0.000	
1.4	7.012	0.000	0.000	0.000	0.000	5.092	12.103
15	0.000	Ø.417	0.000	0.000	\varnothing . \varnothing \varnothing	8.097	8.514
16	14.953	0.000	3.100	2,504	2.862	0.000	23.420
17	0.000	0.000	0.000	0.000	0.000	34.975	34.975
18	0.200	0.000	10.112	0.000	6.535	46.619	63.266
19	150.035	Ø. ØØØ	0.000	0.000	3 0. 813	9.683	190.530
2021	55.234	0.000	8.634	7.155	0.000		73.694
			Ø.525	18.006	0.000	26.043	80.419
22	31,195	4.651				35.058	162.961
77.75	69.186		12.306	0.000	46.410		57.834
24	25.757	Ø. ØØØ	0.000	0.000	2.194	29.883	
25	13.594	$Q \cdot Q Q Q$	1.860	25.876	0.000	7.930	49.260
24	0.000	0.000	1.002		\varnothing . \varnothing \varnothing \varnothing	6.97Ø	39.810
27	39,494	9.182	24.708	0.000	46.410	11.895	131.689
28	7.083	0.000	0.000	0.000	193.798	Ø.ØØØ	2 00. 881
29	31.409	0.000	59.957	0.000	0.000	0.000	91.366
30	43,429	5.605	9.158	0.000	0.000	30.384	88.576
31	17.958	0.000	13.880		0.000	0.000	48,175
32	26.329	0.000	20.510	0.000	59.957	16.110	122.906
					0.000	16.820	16.820
and the	0.000		0.000			Ø. ØØØ	0.000
34	0.000		0.000	0.000	0.000		37.777
35	3.792			18.602	0.000	14.190	
Id	28.476	3,875		0.000	7.870	12.771	73.169
37	14.095	Ø . ØØØ	11.638	0.000	0.200	14.983	40.716
38	2.146	0.000	0.000	0.000	\emptyset . \emptyset \emptyset \emptyset	21.870	
39	2,003	13.773	29.954	0.000	0.000	0.000	45.731
4(2)		4.770	21.035	Ø. ØØØ	7.012	Ø.000	51.419
41		0.000	0.000	0.000	0.000	0.000	10.517
42		0.000	Ø.000	0.000	0.000	47.496	47.496
		18.364	17.076		0.000		105.097
43	69.115				0.000	12,938	23.217
44			3.053	0.000		0.000	0.000
45	0.000		0.000	0.000	0.000		
46			0.700	0.000	0.000	0.000	Ø. ØØØ
47	1.717	22.836	10.446	0.000	0.000	0.000	34.999
48	Ø.ØØØ	0.000	Ø.ØØØ	0.000		40.943	128.135
49	Ø.000	0.000	17.171	12.044	0.000	0.000	29.215
50	Ø. ØØØ	0.000	0.000	0.000	0.000	0.000	0.000
76	74.481	0.000	0.000	0.000	0.000	17.446	91.926
97	90.078	0.000	Ø. ØØØ	29.573		12.187	
7 / 98	0.000	0.000	0.000	0.000		0.000	311.422
				0.000	0.000		29.883
99		0.000			Ø.000	0.000	
100	13,165	27.128	1.145	91,938	K1 - K190AQ	ET S KTETAT	المناحة الماحدة
negre peny ment on it. Defe	a struktir si da min si	2 mg 4 - mg 4 20	aros ora	traca machini	1649.976	401 S04	4507 ASS
TUTALS	1256.156	1/1:/14	427.20C	SIGNOR	10~74747/0	الكالية عداد فيالك	E Sout Short F. Dr. Made F. Sout

TABLE B.6 ESTIMATED NON-RESIDENTIAL NON-POTABLE WATER DEMAND BUILDOUT (MGY)

							and by tank as a
TAZ	GENUSE	LIMUSE	CORUSE	WATUSE	INDUSE	INSTUSE	TOTAL
1	77.654	0.000	4.609	0.000	0.000	5.208	87.471
erry with	37.122	0.000	0.000	0.000	0.000	20.845	57.989
-3	22.033	25.664	1.200	3.754	2.904	22.665	78.222
4	16.857	10.654	0.631	3.504	0.000	33.871	45.514
- tar	15.910	8.049	25.190	6.092	Ø. ØØØ	27,179	82.420
6	19.761	0.000	20.960	0.000	0.000	5.650	46.371
7	64.269	0.000	27,400	0.000	42.299	0.947	134.915
8	24.369	0.000	14.457	0.000	0.000	2.620	41.447
9	47.665	0.000	14.710	0.000	8.870	0.000	71,246
				3.756			42.994
10	12.816	4.167	18.751		3.504	0.000	
11	0.000	0.000	17.488	0.000	0.000	7.071	24.559
12	1.768	0.000	0.442	0.000	0.000	1.010	
13	2.210	0.000	27.021	0.000	0.000	0.000	29.231
14.	6.187	0.000	0.000	0.000	0.000	3.851	10.038
15	Ø.ØØØ	0.331	0.000	0.000	0.000	6.124	6.455
íó	13.195	0.000	4.104	0.663	1.894	0.000	19.855
17	0.000	0.000.	0.000	0.000	0.000	26.453	26.453
18	0.000	0.000	13.384	0.000	4.325	35.260	52.969
19	132.390	0.000	0.000	0.000	20.392	7.323	160.106
2021	48.739	0.000	11.427	1.894	0.000	2.020	64.080
	27.526	3.693	0.694	4.767	0.000	19,698	56.378
23	61.050	0.000	16.288	0.000	30.714	26.516	134.568
24	22.728	0.000	0.000	0.000	1.452	22.602	46.782
25	11.995	0.000	2.462	6.85Ø	0.000	5.998	27,305
	0.000	0.000	1.326	8.428	0.000	5.272	15.026
26			32.703				
27	34.849	7.292		0.000	30.714	8.996	114.555
28	6.25 0	0.000	0.000	0.000	128.255	0.000	134.505
29	27.715	0.000	79,358	0.000	0.000	0.000	107.074
3Ø	38.322	4,451	12.122	0.000	0.000	22.980	77.875
31	15.846	0.000	18.372	4.325	0.000	0.000	38.543
32	23.233	0.000	27.147	0.000	39.679	12.185	102.244
33	\emptyset , \emptyset \emptyset \emptyset	0.000	0.000	0.000	0.000	12.721	12.721
34	Ø.ØØØ	0.000	0.000	0.000	0.000	Ø.ØØØ	Ø.ØØØ
35	3.346	0.000	1,578	4.924	Ø.ØØØ	10.733	20.581
36	25.127	3.078	26.705	0.000	5,208	9.659	69.778
37	12.437	0.000	15.404	0.000	0.000	11.332	39.174
38	1.894	0.000	0.000	0.000	0.000	16.541	18,435
39	1.768	10,938	39.648	0.000	0.000	0.000	52.353
40	16.415	3.788	27.842		4.640	0.000	52.485
41	7.281	0.000	0.000	0.000	0.000	0,000	9.281
42	Ø. 200	0.000	0.000	0.000	0.000	35.923	35.923
43	60.987	14,584	22.602	0.000	0.000	0.410	98.582
			4.041	0.000		9,786	
44	6.376	0.000			0.000		20.203
45	0.000	0.000	0.000	0.000	0.000	0.000	0.000
46	0.000	0.000	0.000	Ø.000	0.000	0.000	0.000
47	1.515	18.135	13.826	0.000	0.000	0.000	33.476
48	Ø.000	0.000	0.000	0.000	57.704	30.967	88.670
49	0.000	0.000	22.728	3.188	0.000	0.000	25.916
50	Ø. Ø ØØ	Ø.000		0.000	0.000	0.000	0.000
96	65.722	0.000	0.000	0.000	0.000	13.195	78.916
97	79.485	0.000	0.000	7.828	503.296	9.217	599.827
98	0.000	0.000	0.000	0.000	206.098	0.000	206.098
99	Ø. Ø Ø Ø	0.000	0.000	0.000	0.000	22.602	22.602
100	11.616	21.544	1.515	24.338	0.000	0.000	59.014
an any daf	p- 6/ 100 100 4100						,
TOTALS	1108.428	136.367	568,135	84.314	1091.948	515.450	3504.643
			** ***				

APPENDIX C

ESTIMATED UTILITY DEMAND
1983 EXISTING AND COMMITTED AND BUILDOUT

TOTALS	TALICE A CONTROL OF THE CONTROL OF T
0.000	
0.000	
196.957	## ## ## ## ## ## ## ## ## ## ## ## ##
1015,590	2214100 2214100 2214100 2214100 2214100 2214100 2214100 2214100 2214100 2214100 2214100 2214100 2214100 2214100 2214100 2214100 221410
234. 186	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
25.411	######################################
81.742	
3.105	00000000000000000000000000000000000000
9.310	NOOHOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
1566.301	NOND NOND
3177.403	707 POT
4743.703	73.6.596.5.293 73.6.2.293 73.6.2.293 74.6.313 74.6.313 74.6.313 74.6.313 74.6.313 74.6.313 74.6.313 74.6.313 74.6.313 74.6.313 74.6.313 74.6.313 75.6.33 76.6.

5° A. 5	ምም ዜ ያደጣያው <i>ነ</i> ን ፤	that were	COR	MATER	TAITHEAT	TAICTTT	TOTAL
TAZ	GENERAL 81.827	O. OOO			INDUST. 0.000	0.000	81.827
1 2	34.270		0.000			0.000	34.270
	28.275	36.165				0.000	77.665
						21.888	51.395
4	10.451						
5	19.796	11.343				40.011	
6	19.363			0.000		8.318	29.625
7	33.217	,		0.000		0.093	
8	28,275	4.2 14 VII. VII. VIII.				3.857	
9	12.153	Date M. 1917 May 2018		0.000		0.000	30.018
1 0	12.892		7.832	14.754		0.000	
11	0.000	0.000		0.000		10.409	
12	2.268			0,000		1.487	
1.3	2.836	0.000		0.000		0.000	
1.4	7.940			0.000		5.669	
15	0.000	0.000		0.000		4.879	
16	13.773	0.000		2.604		0.000	
17	0.000		0.000			38.943	38.943
i8	0.000	0.000	**			51.908	71.211
19	150.Ø44			0.000		8.086	187.650
2021	62.545	0.000	10.348			2.974	75.882
22	15.231	5.205	0.629		0.000	28.998	68.784
23	61.249	0.000	0.000	0.000	43.257	12.780	117.286
24	22.604	0.000				33.273	58.289
25	14.502	0.000	0.915	26.904	Ø.000	7.668	49.988
26	0.000	0.000	0.000	31.863	0.000	0.929	32.792
27	20.254	7.607	2.115	0.000	38.486	13.244	81.706
28	8.021			0.000	131.765	0.000	139.785
29		0.000	10.462	0.000	0.000	0.000	16.781
30	12.558		2.687	0.000	0.000	13,616	30.262
31	7.616	0.000	0.000	3.843	0.000	0.000	11.459
32	0.000			0.000		0.000	27.370
33	0.000	0.000				10.728	18.728
34	0.000			0.000			
35	4.294	0.000	0.572			0.000	
36	16.933	4.004			3.785	8.132	
37	0.000	0.000		0.000			0.000
38	0.000	0.000		0,000			0.465
	0.000	4.004					4.975
420	18.472	0.000		0.000	7.708	0.000	
41	0.000	0.000		0.000		0.000	
42	0.000	0.000		0.000		30.299	
4.3		4.537				0.604	
	47.476		0.000			4.694	
44	9.183			· · · · · · · · · · · · · · · · · · ·			
45	0.000		n-				0.000
46	0.000		0.000				0.000
47		12.411				0.000	
48	0.000	0.000	o.vov	0.000		0.000	
49	0.000	0.003	19.780			0.000	
50	0.000	0.000				0.000	
96	30.868	0.000	,	0.000	0.000		
97	50.879				172.872		
98	0.000				21.655		21.455
99			0.000				0.000
100	1.458	0.000	0.000	47.732	0.000	0.000	49.191
TOTALS	867.775	107.561	179.737	236.307	524.122	404.948	2320.465

TOTALS	2 2 2 2 2 2 2 3 4 4 4 5 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	
0.000		
0.000	00000000000000000000000000000000000000	
605.267	ESTRIE 2. 181 2.	
2275, 910	10000000000000000000000000000000000000	
415.915	MEDIUM 112.0000 112.00000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.0000 112.00000 112.00000 112.00000 112.00000 112.00000 112.000	
56.323	10.00.000.000.000.000.000.000.000.000.0	
96.827	00000440000000000000000000000000000000	
25.614	00000000000000000000000000000000000000	
30.561	10010010000000000000000000000000000000	1
3506.417	NONPOT. 75.959 76.879 77.086	
10305.844	POTABLE 2009 1191 192 193 193 193 193 193 193 193 193 193 193	
13812.261	TOTAL 22427 TOTAL 24427 TOTAL	

TAZ	GENUSE	LIMUSE	CORUSE	WATUSE	INDUSE	INSTUSE	TOTAL
i.	99.651	0.000	4,173	0.000	0.000	7,668	111.492
2	47.638	0.000		0.000	0.000	30.717	78.355
3	28,275	36.165	1.086	14.754	4.824	33.366	118.470
4	21.632	15.013	0.572	13.762			100.842
J	20,416	11.543	22.810	23.928		40.011	118.509
				0.000		8.318	52.657
6	25.358	0.000					
7	82.476	0.000				1.394	178.941
E }	51,273	0.000	13.092	0.000	11	3.857	
9	61.168	0.000	the contract to	0.000		0.000	
iØ	16.447	5.872	16,979	14.754		0.000	
11	\emptyset , $\emptyset\emptyset\emptyset$	Ø.ØØØ		Q.QQQ		10.409	
12	2.268			0.000		1.487	
13	2.836	0.000	24.468	0.000	Ø.ØØØ	Ø.ØØØ	27.304
14	7.940	0.000	0.000	0.000	0.000	5.669	13.609
15	0.000	0.467	0.000	0.000	0.000	9.015	9.482
16	16.933	0.000	3.716	2.604	3.146	0.000	26,398
17	0.0 00			0.000	0.000	38.943	38.943
18	0.000	0.000			7.183	51.908	71.211
19	169.893			0.000		10.781	
2021	62.545	0.000				2.974	83.306
	35.324	·	2.629			28.998	98.876
22							183.146
23	78.344	0.000		0.000		39.036	
24	29.166					33.273	64.851
<u>ு ಮ</u>	15.393					8.829	
26	0.200		1.201	33,103		7.761	
27	44.722	10.276		0.000		13.244	
28	8.021	Ø.ØØØ	0.000	0.000	213.036	0.000	221.057
29	35,567	0.000	71.860	0.000	0.000	0.000	107.427
30	49.177	6.272	10.976	0.000	0.000	33.831	100.257
31	20.335	0.000	16.636	16.985	0.000	0.000	53,957
32	29.814	0.000		0.000		17.938	138,243
33	0.000	0.000				18.728	18.728
34	0.000	0.999	Ø. Ø Ø Ø	0.000			0.000
35	4.294	0.000	1,429				
36	32.245	4.337		0.000	8.651	14.220	
37		0.000	13,949	0.000			
36		0.000	0.000		0.000		
	2.268				0.000		
		5.338	-,	9.000		0.000	
41		0.000					11.910
42		0.000			0.000		
43			20.466		0.000		119.884
44		Q.QQQ			0.000		
45	0.000	0.000	0.000	0.000	0.000	0.000	Ø. ØØØ
46	0.000	0.000	0.000	0.000	0.007	Ø.ØØØ	Ø.ØØØ
47		25.556			0.000	0.000	40.020
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TOTALS	1422.420	192.169	514,457	331.152	1813.768	758.824	50 32.790

APPENDIX D

WASTEWATER RECLAMATION

WASTEWATER RECLAMATION

Consideration of wastewater reclamation in the Martin County Water Supply Study is important because of the potential for efficient use of the water resource coupled with appropriate and beneficial disposal of wastewater effluent. Wastewater reclamation will benefit Martin County in several major ways:

- 1. By providing a quality, reliable source of irrigation water for large scale landscape demands.
- 2. By improving the level of treatment of wastewater and by providing an approved beneficial means of disposal.
- 3. By creating an additional source of groundwater recharge in many areas of the county.
- 4. By reducing the demand on the groundwater resource by large scale landscape irrigators.

In other areas of South Florida, wastewater has become an important priority source of irrigation water. Elaborate systems have been designed for the Naples area golf courses, while wastewater has been available for large and small scale irrigators in St. Petersburg for several years.

In Palm Beach County, a number of golf courses are being scheduled to receive wastewater effluent from the Loxahatchee River Environmental Control District (ENCON). The use of reclaimed wastewater in most new systems including ENCON, Naples, and St. Petersburg is backed up by the use of deep injection wells. These wells are used during periods of wet weather when irrigation demands are extremely low and during events when the quality of effluent treatment cannot be assured (eg. physical or chemical/biological treatment plant breakdowns).

As water conservation continues to make more sense for local governments,

wastewater reclamation serves as an important tool in water supply demand planning. The inclusion of wastewater reclamation potential in this study reflects a position of responsibility towards efficient management of the water resources in and by Martin County.

The values presented in this section provide projections of levels of implementation of wastewater reclamation efforts in Martin County. Because the county has not completed the Wastewater Master Plan and information is not available as to location and capacity of specific "future-build" treatment plants and service areas, this study only delineates supply-demand scenarios for localized potential systems. These scenarios are based upon existing and buildout supply calculations and have alternative levels of implementation for potential reuse systems. The intent then, of this effort, will be to assess the regional potentials for wastewater reclamation in the urban areas of Martin County.

In the implementation of any wastewater reclamation system, many factors must be taken into consideration. Factors such as soils, topography, physical location, user profiles, public reaction and sentiment, and present source (potential source), among others, all affect potential users. Factors such as treatment process, present or potential disposal, service area, transportation routes, bonded indebtedness, treatment plant age and condition, service area characteristics and collection systems, and influent characteristics among others all affect the potential supplies.

This study will draw conclusions as to the most evident of the variables in a supply-demand network for wastewater reclamation potential. Geographic location and physical proximity factors will be the basis for apparent conclusions regarding the most and least feasible networks pairing users and suppliers within geographic areas.

Methodology

In developing wastewater reclamation scenarios the first step was to identify regional areas within Martin County which might be served by integrated supply networks. The County's planning areas were investigated, but in many cases these areas were too farflung or crossed geographic barriers such as the St. Lucie Canal. Thus there was a need to modify these geographic areas to divisions that would be more suitable for the physical implementation of wastewater reclamation networks.

The county was divided into 10 reclamation (reuse) planning areas. These areas are built upon aggregations of whole Traffic Analysis Zones (TAZs). In the tables the areas and their TAZs are listed by footnote.

Populations were derived from the population figures supplied by Martin County for this study. Table D.1 (Part A) represents populations derived from existing and committed figures, as well as area populations at buildout (Part B) based upon county projections.

In both Parts A and B of Table D.1, the "Green Acres" columns provide projections of the number of potential wastewater irrigated acres on golf courses and other major irrigated landscape tracts such as parks and recreation areas, and sports playing fields. Acreages in Part "A" are based upon information supplied by the County's Planning Department and by review of planning documents such as "Applications for Development Approval" for Developments of Regional Impact. Acreage in Part "B" is derived by adding Part "A" totals and totals for "future" acres next described.

In Part "B", acreage beyond existing and committed is based upon a calculation using the ratio of golf course acreage to population. For Martin County the present ratio is approximately 17 acres per 1000 population. A figure of 20 acres per 1000 population was used to adjust the present ratio

Table D.1. ESTIMATED EXISTING AND FUTURE (BUILDOUT) DEMANDS FOR IRRIGATION OF GREEN AREAS IN MARTIN COUNTY WITH RECLAIMED WASTEWATER, BASED ON THREE LEVELS OF USE (25%, 50% and 100%) OF THE AVAILABLE SUPPLY

A 1,2,3,5,6,7,8,10 A 1,2,3,5,6,7,8,10 B 4,14,15 C 9,11,12,13,16,17,18,19,20,21,22,23 D 24,25,26,27,28,29,30,31 E 32,33,34,35,36 H 46,47,48,49,50 I 100 Existing and Committed population data from Martin County Planning Dept. B 4,14,15 C 9,11,12,13,16,17,18,19,20,21,22,23 C 9,11,12,13,16,17,18,19,20,21,22,2	A 49327 770 3081544 6786439 1696610 55.06 0 3393219 110.11 311675 B 12783 301 1205688 1584140 396035 32.85 0 792070 65.69 0 C 30768 391 1564200 5150624 1287656 82.32 0 2575312 164.64 101112 D 47626 1025 4098008 6578487 1644622 40.13 0 3282243 80.26 0 E 288090 716 2863576 3250953 812738 28.38 0 1625477 56.76 0 F 12572 552 2206824 805682 201420 913 0 402841 18.25 0 G 89109 1748 6990544 7657817 1914454 27.39 0 3828909 54.77 0 H 14170 608 2431464 1826053 1591321 54.55 0 913026 37.55 0 J 10869 296 1182016 577913 144478 12.22 0 288956 24.45 0	B. Buildout TARGET REUSE 25% TARGET REUSE 50% T Reuse Green Demand ⁴ Flow ⁵ Available ⁶ Demand Excess ⁸ Available ⁸ Avail	A 21608 216 864000 1997587 499397 57.80 0 998793 115.60 134793 1 B 9612 238 952000 1079165 269791 28.34 0 539583 56.68 0 1 C 23765 251 1004000 3854711 963678 95.98 0 1927356 191.97 923356 3 D 21350 499 1996000 2172024 543006 27.20 0 1086012 54.41 0 1 E 20964 559 2236000 1803894 450973 20.17 0 901647 54.41 0 1 F 1937 339 1356000 107403 26851 1.98 0 53701 3.96 0 1 G 18727 340 1360000 1534883 383721 28.21 0 767442 56.43 0 1 H 5827 441 1764000 446737 111684 6.33 0 223369 12.66	A. Existing and Commited Land Uses A. Existing and Commited Land Uses TARGET REUSE 25% TARGET REUSE 50% T. TARGET REUSE 25% TARGET REUSE 50% T. TARGET REUSE 25% TARGET REUSE 50% T. Series Supply % Green Supply %
olf courses, and other large areas. Existing and Commit Dept. and DRI's Buildout b. Ise data plus an estimated 2 see data plus an estimated 2 nber of green acres × 4000 g. (Target %) availability cale irrigated acres demand supplied by (Target %) availability cale irrigated acres demand supplied by the control of the reclamation de significant services and services are services are services and services are services are services and services are services are services are services.	311675 0 1011112 0 0 0 0 0 0 0 0 265338 0 265338	REUSE 50% % Green Demand Excess ⁸ Met ⁷ (gallons)	134793 923356 90 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	50% Excess ⁸ (gallons)
other large irrigated tracts such as parks and Committed based on data from Martin Buildout based on existing and stimated 20 acres per additional thousand es x 4000 gal/day/acre (average irrigation supplied by utility systems lablity es demand met by available martion demand in reuse area.	6786439 220.23 3704894 1584140 131.39 378452 5150624 329.28 3586423 6578487 160.53 2480478 3250582 165.53 387377 805682 36.51 0 7657817 109.55 667273 1826053 75.10 0 6365283 218.19 3447979 577913 48.89 0	TARGET REUSE 100% Supply % Green Excess8 Available Demand Excess8 (gallons) Met7 (gallons)	997587 231.20 1133587 1079165 113.36 127165 8854711 383.94 2850711 2172024 108.82 176024 1803894 0 107403 7.92 0 1534883 112.86 174883 446737 25.33 0 277188 51.33 654741 277188 51.33 0	TARGET REUSE 100% Supply % Green Excess8 Available6 Demand Excess8 (gallons) Met? (gallons)

for trends observed in and outside of the county (such as in Palm Beach County) and the additional acreage resulting from projected public access areas such as parks and recreational areas.

The columns headed "Potential Demand" result from calculations made by multiplying the "Green Acreage" by a factor of 1 inch irrigation per week. An application rate of 1 inch per week is an established preferred rate of effluent irrigation on golf courses in south Florida.

This 1 inch of irrigation per week translates to 4,000 gallons per acre per day (average). This resultant figure is expressed as the potential irrigation demand on identified large landscape irrigation parcels within each reuse area.

The wastewater flow (potential supply) was calculated as being equal to the indoor water demand supplied by utility systems.

The target reuse scenarios are meant to demonstrate the amounts of reuse that would be achieved under alternative levels of implementation and to specify how much of that could come from traditional use patterns, such as application to golf courses. These levels of effluent use are set at 25%, 50%, and 100% of listed treatment plant output to correspond with low, medium, and high levels of implementation efforts.

Because the wastewater treatment and disposal planning process is just getting underway in Martin County as was explained in the introduction, and because the potential users could only be specified in general, it was not possible to give detailed policies and costs which would achieve the alternative levels of implementation. The most common constraint to full implementation will be cost. Under two of these scenarios, 25% and 50%, some effluent supply will be unavailable. The resulting two columns represent the percentage of demands met on identified "green acres" and the additional

supply (in gallons) available for other methods of wastewater disposal in the specific reuse area. All of the water in these columns is considered to be available for gross disposal which, when netted out, will provide some recharge to local surficial aquifers.

Summary

Upon review of Parts "A" and "B" of Table D.1, it is evident that under both existing and committed and buildout conditions reclamation at the low implementation level (25%) would come close to meeting green area demand only in the Stuart area (Reuse Area C).

In an effort to both optimize groundwater recharge and to develop alternative water sources for existing and projected "green acreage" demands, reclamation efforts utilizing between 50% and 75% of available effluent should be targeted. The quantities available (see Table D.1) at these target levels represent the most promising mechanisms for recharging the groundwater system. Large scale irrigation users combined with low cost percolation pond systems will make reclamation efforts feasible in most reuse areas.

Considering the logistical problems with disposing of supplies not being used on large scale landscaping, 50-75% target programs aimed at "Green Acreage" users probably should not be designed for reuse areas E, F, H, and J. These low demand areas present reclamation opportunities only if on site reuse is practiced on large scale PUDs and similar developments.

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